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REMARKS

Claims 1-26 are pending in the present application. Claim 4 has been cancelled, Claims 5, 9, 21, 22, and 24 have been amended, and Claim 27 has been added, leaving Claims 1-3 and 5-27 for consideration upon entry of the present Amendment.

New Claim 27 is Claim 4 rewritten in independent form. The Examiner stated that Claim 4 would be allowable if rewritten in independent form. As such, Claim 27 is allowable.

Claim 5 has been amended merely to correct the dependency of the claim. Claim 5 now depends from allowable Claim 27.

Support for the amendment to Claim 21 can at least be found in Figures 1-2, and in the specification at page 5, lines 1-30 and page 7, line 22 to page 8, line 8.

Claim 22 has been amended merely to remove the redundant limitations that resulted when independent Claim 21 was amended to include those limitations.

Claims 9 and 24 have been amended to more clearly define Applicants' invention.

Applicants respectfully request that these amendments be entered because they 1) do not raise new issues that would require further consideration and/or search; 2) they do not raise issue of new matter; 3) the only new claim presented is Claim 27, which is Claim 4 rewritten as an independent claim; and 4) the amendments place the claims in a better condition for allowance.

No new matter has been introduced by these amendments. Reconsideration and allowance of the claims is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1-3, 6, 10, 11 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by U.S. Patent No. 4,900,425 to Sasayama et al. Applicants respectfully traverse this rejection.

Applicants' independent Claim 1 is directed to a gas sensor, comprising: a first electrode and a reference electrode with an electrolyte disposed therebetween, wherein the first electrode and the reference electrode are in ionic communication, wherein the reference electrode has a surface on a side of the reference electrode opposite the electrolyte and the surface has a surface area; and a reference gas channel in fluid communication with the reference electrode, wherein at least a portion of the surface of the reference electrode physically contacts at least a portion of

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the reference gas channel, and wherein the portion of the reference electrode in physical contact with the reference gas channel is less than about 90% of the surface area.

Sasayama et al. teach an oxygen sensor in which an airtight reference chamber, isolated from a surrounding space, is formed on one main surface of a solid electrolyte. (Abstract). A "current is supplied to the solid electrolyte to pump oxygen from the reference chamber in such a manner that oxygen in the reference chamber is ionized and then passes through the solid electrolyte." (Abstract).

To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Varient Inc.*, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

In making the rejection, the Examiner stated that "[e]ven though patent drawings may not be exactly to scale, they generally show relative sizes of one component to another." (O.A., page 2). Additionally, the Examiner alleged that Sasayama et al. "shows more than 10% of the reference electrode outside of the reference gas channel." Applicants respectfully disagree.

Drawings and pictures can anticipate claims if they clearly show the structure which is claimed. *In re Mraz*, 455 F.2d 1069, 173 USPQ 25 (CCPA 1972); MPEP 2125. However, Sasayama et al. do not clearly show each and every element of Applicants' independent Claim 1. More particularly, Sasayama et al. fail to teach the portion of the reference electrode in physical contact with the reference gas channel is less than about 90% of the surface area.

Applicants respectfully maintain their position asserted in Paper 6, i.e., a determination of whether "the portion of the reference electrode in physical contact with the reference gas channel is less than about 90% of the surface area" cannot be made using Figure 8 of Sasayama et al. without some reference as to scale or proportion. (See MPEP §2125 "When the reference does not disclose that the drawings are to scale, and is silent as to dimensions, arguments based on measurement of the drawing features are of little value, citing *In re Wright*, 569 F.2d 1124, 193 USPQ 332 (CCPA 1977):

Since Sasayama et al. are silent to the scale or portion of the drawings, the Examiner's use of the drawings is improper. Nevertheless, even if one were to assume the drawings were to scale, even though there is not any indication that they are to scale, the drawings would still fail to teach each and every element of Applicants' independent Claim 1.

For example, a cross sectional drawing, e.g., Figure 8 in itself would not provide a teaching of the dimensions of the electrode. More particularly, the hatched lines that the

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Examiner is relying upon as being an electrode may actually depict the electrode and a conductor coupled to a lead. (See Figures 2 and 3). In other words, one of skill in the art could not ascertain exactly where the electrode ends and the lead and conductor begins. As such, the cross-sectional drawings fail to clearly show the structure that is claimed.

Furthermore, in continuing with the above hypothetical, if the cross-sectional drawings were compared to a perspective view drawing, e.g., Figure 2, to obtain the relative sizes of one component to another as suggested by the Examiner, the drawings would still fail to teach each and every element of Applicants' independent Claim 1. For example, compare Figure 1 and Figure 2. Electrodes 18 and 20 are called out in both figures. While electrode 12 is not called out in Figure 2, it appears to be depicted as a phantom drawing. As such, if one of skill in the art were to compare the elements of Figure 1 and Figure 2 to obtain relative sizes, it would appear that about 100% of the electrode surface area would be in contact with the reference gas channel. It is not clear from these figures the size of the reference gas channel and hence the size relationship between the reference electrode and the reference gas channel. Accordingly, independent Claim 1 is not anticipated by and is allowable over Sasayama et al. Moreover, as dependent claims from an allowable independent claim, Claims 2-3, 6, 10 and 11 are by definition also allowable.

Additionally, it is noted that the Examiner merely addressed Claim 1 by stating, "[i]f there is a small portion of the reference electrode not in contact with the reference gas channel, the present claim language would be met." (O.A. Page 2). However, Applicants direct the Examiners attention to Claims 2 and 3. In those claims, the respective portion of the electrode in physical contact with the reference gas channel is less than about 75% of the surface area and less than about 50% of the surface area. As such, even based upon the Examiner's position and even if the Examiner were to find Claim 1 not allowable, Claims 2 and 3 are allowable.

Claims 21, 24, and 25 stand rejected under 35 U.S.C. § 102(b), as allegedly anticipated by U.S. Patent No. 4,107,019 to Takao et al. Applicants respectfully traverse this rejection.

Independent Claim 21 is directed to a gas sensor, comprising: a first electrode and a reference electrode with an electrolyte disposed therebetween, wherein the first electrode and the reference electrode are in ionic communication, wherein the reference electrode has a surface on a side of the reference electrode opposite the electrolyte and the surface has a surface area, and

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wherein the reference electrode is circular having a diameter and is in contact with an insulating layer having a width, wherein the diameter is about 60% to about 85% of the width of the insulating layer; and a reference gas channel in fluid communication with the reference electrode, wherein at least a portion of the surface physically contacts at least a portion of the reference gas channel.

Takao et al. teach an oxygen sensor a first electrode and a second electrode with an electrolyte disposed therebetween. (Figure 1). Absent, however, is any teaching or suggestion that a reference gas channel is in fluid communication with a reference electrode, wherein at least a portion of a surface of the reference electrode physically contacts at least a portion of the reference gas channel. Since Takao et al. fail to teach at least this element, Takao et al. fail to teach each and every element of independent Claim 21. As such, independent Claim 21 is not anticipated by and is allowable over Takao et al. Moreover, as dependent claims from an allowable independent claim, Claims 24 and 25 are, by definition also allowable.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 7-9 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,900,425 to Sasayama et al. in view of U.S. Patent No. 5,976,350 to Yamada et al. or U.S. Patent No. 6,287,439 to Kato et al. Applicants respectfully traverse this rejection.

Yamada et al. is directed to a method of detecting an activated condition of a wide range air-fuel ratio sensor. (Abstract). Yamada teaches a sensor having an impedance from within a range of 1,000 to 5,000 ohms. (Col. 8, lines 55-57).

Kato et al. teach a gas sensor to decrease the offset value to a degree in which no trouble occurs in the measurement without causing any reduction of NO_x so that the measurement accuracy is improved. (Abstract). Kato et al. teach a sensor having an impedance of not less than 1,000 ohms (Col. 4, lines 51-56 and Col. 12, lines 52-57).

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from

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the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

In making the rejection, the Examiner is relying upon Yamada et al. and Kato et al. as secondary references for their teaching of an impedance below 4,000 ohms. However, as discussed above, the primary reference fails to teach or suggest, "the portion of the reference electrode in physical contact with the reference gas channel is less than about 90% of the surface area." Since Sasayama et al., the primary reference, fails to teach or suggest at least this element, in order for the obviousness rejection to be proper, the secondary references must cure this deficiency, i.e., in addition to their teaching of an impedance below 4,000 ohms, they must teach or suggest "the portion of the reference electrode in physical contact with the reference gas channel is less than about 90% of the surface area." Absent in Yamada et al. and Kato et al. is any teaching or suggestion that the reference gas channel is less than about 90% of the surface area. As such, even if combined, the above cited references, either alone or in combination fail to teach each and every element of Applicants' independent Claim 1. For at least the reason that Claims 7-9 dependent from Claim 1, they are also allowable.

Claims 12-16 and 20 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,900,425 to Sasayama et al. in view of U.S. Patent No. 5,529,677 to Schneider et al. or U.S. Patent No. 5,169,512 to Wiedenmann et al. Applicants respectfully traverse this rejection.

Applicants' independent Claim 12 is directed to a method for forming a gas sensor, comprising: disposing an outer electrode and a reference electrode on opposite sides of an electrolyte such that the outer electrode and the reference electrode are in ionic communication, wherein the reference electrode has a surface on a side of the reference electrode opposite the electrolyte; disposing at least a portion of a fugitive material in physical contact with a portion of the reference electrode surface, wherein the reference electrode has a surface area and the portion of the reference electrode surface in physical contact with the fugitive material is less than about 90% of the surface area; disposing a heater on a side of the fugitive material opposite the reference electrode to form a green sensor; and co-firing the green sensor.

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Schneider et al. teach a planar polarographic sensor for determining the lambda value of gas mixtures, for use with exhaust gases in internal combustion engines. (Abstract). A reference electrode is arranged at a lower side of a thin solid electrolyte sheet and is in contact with a reference gap. (Col. 3, lines 55-57). They teach pore forming substances, for example, "carbon black powder, plastics, for example, polyurethane base; salts, for example ammonium carbonate; and organic substances such as, for example, theobromine and indanthrene blue. (Col. 4, lines 47-51). Absent in Schneider et al. is any teaching or suggestion of using this pore forming substance to form the reference channel, i.e., "disposing at least a portion of a fugitive material in physical contact with a portion of the reference electrode surface, wherein the reference electrode has a surface area and the portion of the reference electrode surface in physical contact with the fugitive material is less than about 90% of the surface area."

In other words, since Sasayama et al. failed to teach or suggest this element, the secondary reference must teach or suggest this element in order for the obviousness rejection to be proper. Since Schneider et al. fails to teach this element, the obviousness rejection is improper. Accordingly, independent Claim 12 is allowable over Sasayama et al. in view of Schneider et al. Moreover, as dependent Claims from an allowable independent claim, Claims 13-16 and 20 are, by definition, also allowable.

Furthermore, even if the Examiner were still to find Claim 12 obvious over the above cited references, Applicants direct the Examiner's attention to Claim 15 and 16. It is noted that the Examiner found apparatus claims directed to similar subject matter allowable (Claims 4 and 5). Applicants respectfully submit that Claims 15 and 16 are at least allowable. Accordingly, Applicants respectfully request the Examiner to withdraw these rejections and allow these claims.

With regard to Wiedenmann et al., they teach a planar polarographic probe for determining the lambda value of gas mixtures, in particular of exhaust gases of internal combustion engines. (Abstract). They further teach stamping a body from a foil, which becomes porous on sintering, and coating the body first with a substance that is combustible, decomposable or vaporizable. (Col. 6, lines 44-56).

As with Schneider et al., there is no teaching or suggestion in Wiedenmann et al. to "disposing at least a portion of a fugitive material in physical contact with a portion of the reference electrode surface, wherein the reference electrode has a surface area and the portion of

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the reference electrode surface in physical contact with the fugitive material is less than about 90% of the surface area.” As a result, Wiedenmann et al. fail to cure the deficiencies of Sasayama et al., and therefore, these references fail to render the claims obvious. For at least those reasons, Applicants submit that independent Claim 12 is allowable. Moreover, as dependent claims from an allowable independent claim, Claims 13-16 and 20 are, also allowable.

Claims 17-19 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,900,425 to Sasayama et al. in view of U.S. Patent No. 5,529,677 to Schneider et al. or U.S. Patent No. 5,169,512 to Wiedenmann et al. and U.S. Patent No. 5,976,350 to Yamada et al. or U.S. Patent No. 6,287,439 to Kato et al. Applicants respectfully traverse this rejection.

With regard to Claims 17-19, Applicants respectfully direct the Examiner’s attention to above discussion of the cited art. Since Sasayama failed to teach or suggest all the elements that the Examiner had relied it upon for teaching, the secondary references had to cure that deficiency, i.e., they had to teach or suggest that element. As previously discussed in detail, Sasayama et al., Schneider et al., Wiedenmann et al., Yamada et al., and Kato et al., all fail to teach or suggest “disposing at least a portion of a fugitive material in physical contact with a portion of the reference electrode surface, wherein the reference electrode has a surface area and the portion of the reference electrode surface in physical contact with the fugitive material is less than about 90% of the surface area.” Since the above cited references fail to teach or suggest this element, a *prima facie* case of obviousness has not been established, and independent Claim 12 is non-obvious and allowable over the above cited art, alone and in combination. As such, Claims 17-19 are allowable for at least the reason that they depend from an allowable independent claim.

Claims 21, 22, 24-26 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,900,425 to Sasayama et al. in view of U.S. Patent No. 5,384,030 to Duce et al. and U.S. Patent No. 5,169,512 to Wiedenmann et al. Claim 23 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,900,425 to Sasayama et al. in view of U.S. Patent No. 5,384,030 to Duce et al. and U.S. Patent No. 5,169,512 to Wiedenmann

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et al. and U.S. Patent No. 5,976,350 to Yamada et al. or U.S. Patent No. 6,287,439 to Kato et al. Applicants respectfully traverse these rejections.

Duce et al. is directed to an "exhaust sensor having a substrate including first and second portions, the first portion comprising a dielectric material, the second portion comprising an electrolyte material and a transition zone interposed between the first and second portions." (Abstract). In making the rejection, the Examiner is relying upon Duce et al. to teach an electrode having a width less than 85% of the width of the insulating layer, while the Examiner relied upon Wiedenmann et al. merely for their teaching of a circular reference electrode.

However, Duce et al. fail to teach or suggest a circular reference electrode having a diameter that is about 60% to about 85% of a width of an insulating layer. Since Duce et al. fail to teach or suggest this element, even if it were combined with Sasayama et al. and Wiedenmann et al., the combined references would fail to teach each and every element of Applicants' independent Claim 21. Applicants teach that:

[p]reviously it was believed that the portion of the reference electrode which did not overlap the reference gas channel would be inactive. Consequently, the reference electrode, to minimize resistance, had a diameter substantially equivalent to the width of the reference gas channel. It has been discovered, however, that a reduction in impedance can be obtained by increasing the size of the reference electrode with the ultimate size merely bounded by the size of the layer upon which the electrode is disposed.
(Page 7, lines 24-30).

In other words, Applicants teach an advantage of a reduction in impedance associated with an increased size of the electrode. Absent in Sasayama et al. either alone or in combination with the above-cited references is any teaching or suggestion to increasing the size of the electrode would relative to reference gas channel and/or the insulating layer. Finally, as discussed in detail above, Wiedenmann et al., Yamada et al., and Kato et al. fail to cure the deficiencies of Sasayama et al. Accordingly, independent Claim 21 is not obvious over and is allowable over Sasayama et al. in view of Duce et al., Wiedenmann et al., Yamada et al., or Kato et al. Moreover, as dependent claims from an allowable independent claim, Claims 22-26, are, by definition also allowable.

Additionally, with regard to Claim 22, it is noted that Claim 22 contains subject matter that was found allowable with regard to Claim 4. More particularly, Claim 22 discloses "the surface in physical contact with the reference gas channel is less than about 25% of the surface

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area." For at least this reason, Claim 22 is allowable independently of a finding that Claim 21 is allowable.

Claims 21, 24 and 25 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,107,019 to Takao et al. in view of U.S. Patent No. 5,169,512 to Wiedenmann et al. Claim 23 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 4,107,019 to Takao et al. in view of U.S. Patent No. 5,976,350 to Yamada et al. or U.S. Patent No. 6,287,439 to Kato et al. Applicants respectfully traverse these rejections.

In making this rejection, the Examiner is relying upon the secondary references to teach the reference electrode being a circular configuration and an impedance below about 4,000 ohms. However, as discussed above, the primary reference fails to teach or suggest each and every element of Claim 21. More particularly, Takao et al. fail to teach or suggest a reference gas channel in fluid communication with a reference electrode, wherein at least a portion of a surface of the reference electrode physically contacts at least a portion of the reference gas channel.

Further, Applicants teach:

It was believed that the portion of the reference electrode, which did not overlap the reference gas channel, would be inactive. This belief posed particular problems for co-fired sensors since the size of the reference gas channel was limited. Essentially, due to the subsequent processing to volatilize the fugitive material (laminating, sintering, and the associated temperatures and pressures), if the channel was too large it would deform (e.g., collapse, pinch off, or the like). Consequently, the size of the reference gas channel was limited due to processing limitations, and hence it was believed that the size of the reference electrode was limited by the size of the channel. Contrary to that belief, however, it has been discovered that, since only a small amount of the reference electrode needs to be exposed to the reference gas channel in order to attain the desired reference gas supply to the reference electrode, the size of the reference electrode is not dependent upon the size of the reference gas channel. Consequently, the reference electrode size can be optimized based upon the overall sensor size (e.g., width of the layer upon which the electrode is disposed). (Specification, page 13, line 20 to page, 14, line 8).

In other words, Applicants teach that electrode size is not limited by the size of the reference gas channel. Absent in the above cited art is any teach or suggestion that would have lead one of skill in the art to make the gas sensor claimed in Claim 1 with any reasonable

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expectation of success. Accordingly, Applicants' independent Claim 21 is not obvious over and is allowable Takao et al. in view of the above cited references. Moreover, as dependent claims from an allowable independent claim, Claims 23-25, are, by definition, also allowable.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 21-26 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to Claim 21, Applicants have made a number of amendments to address the concerns of the Examiner. First, language to the reference electrode "diameter" has been amended to reference electrode "width". Second, the language "is disposed" has been amended to "is in contact with". Support for these amendments can at least be found in Figures 1-2, and in the specification at page 5, lines 1-30 and page 7, line 22 to page 8, line 8. Third, the language "is up to" that precedes 60% to 85% has been removed from the claim.

With regard to Claim 22, antecedent basis for "the reference gas channel" has been provided in independent Claim 21.

With regard to Claim 24, the language "is up to" that precedes 70% to 80% has been removed from the claim.

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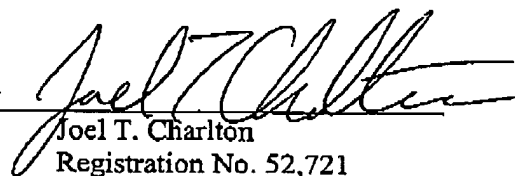
It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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